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NO. 7. NEW AND RARE INDIAN ODONATA IN THE PUSA COLLECTION

NO. 8. FURTHER NOTES ON *RHINOCYPHA* LARVÆ.

BY

MAJOR F. C. FRASER, I.M.S

AGRICULTURAL RESEARCH INSTITUTE, PUSA

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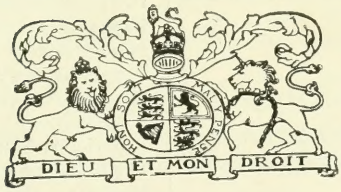

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NEW AND RARE INDIAN ODONATA IN THE PUSA COLLECTION.

BY

MAJOR F. C. FRASER, I.M.S.

[Received for publication on 22nd September 1921.]

SUB-ORDER ZYGOPTERA.

FAMILY CŒNAGRIONIDÆ.

Sub-family Protoneurinæ.

Drepanosticta viridis, sp. nov.

Two males (in spirit), King Island, Mergui, Burma, 4th June 1921, collected by J. R. Elton Bott. One female (in paper, teneral) from the same locality and most probably related to the two males.

Male. Abdomen 50 mm. Hindwing 25 mm.

Head. Eyes pale yellow, capped broadly above with puce ; labium white ; labrum and anteclypeus white, the former bordered narrowly with jet black ; rest of head metallic blue.

Prothorax a dirty yellow, unmarked except for the posterior lobe which is transversely elongate and dark brown.

Thorax metallic green on the dorsum, pale reddish brown subdorsally and dirty yellow on the sides ; two obscure brownish stripes on the lateral sutures.

Legs yellowish, striped with black.

Wings hyaline : stigma reddish brown, its costal border much shorter than its posterior and its lateral borders rounded. Postnodal nervures to forewing 14 to 15, 14 in the hind. *Ab* runs between the posterior margin of the wing, just distal to *ac*, and the underside of the quadrilateral.

Abdomen extremely elongated and attenuated, dilating at segments 8 to 10. Segments 1 to 7 brownish, this colour deepening at the apices and not quite extending to the extreme base, so that a small, whitish annule is left. Segments 8 and 9 are a beautiful sky-blue which on the former is replaced on the basal half or third by black ; the black extends into the blue on the middorsum and wraps around it at the side so that the blue forms two points directed basally. Segment 10 is all black.

Anal appendages of striking shape. The superior bent at their middle to a full right angle, the apical half bending down abruptly and with the apex shortly and bluntly bifid ; at the angle, on the dorsal surface, is a fine, needle-like spine. Inferior appendages stout at the base, narrowing abruptly at their middle and then tapering and curling up like a sickle.

The ends of the superior lie between the two inferior prongs ; the former black, the latter white.

Female. Abdomen 37 mm. Hindwing 25 mm.

Much shorter and more stoutly built than the male. Very similar to the male in colouring, but there is no blue on segments 8 and 9 ; the white annules are well defined on segments 1 to 6 and the brown on the body generally is of a deeper shade. The dorsum of the thorax is metallic green as in the male.

Habitat. Swamps and running streams in a three-year old rubber plantation.

From *Drepanosticta carmichaeli* this species is easily distinguished by the metallic colouring on the dorsum of the thorax and by not having blue humeral stripes.

Type (male) in the Pusa collection.

Caconeura theebawi, sp. nov.

Two males from King Island, Mergui, Burma, 4th June 1921, collected by J. R. Elton Bott.

Male. Abdomen 29 mm. Hindwing 19 mm.

Head black, marked with purplish blue as follows :—a transverse stripe at the level of the ocelli, the base of the labrum, the labial palps and the cheeks. Eyes black above, dove-grey beneath.

Prothorax black with a purplish blue stripe along each side. Posterior lobe scale-like, quadrate, simple.

Thorax black, marked with purplish blue as follows :—a narrow, ante-humeral stripe narrowing gradually from below upwards and not extending

as far as the alar sinus, a lateral, moderately broad stripe, and the posterior part of the metepimeron.

Legs black.

Wings hyaline : stigma blackish brown, its inner border considerably shorter than the outer, 15 postnodal nervures to the forewing, 13 in the hind ; Cu^2 4 cells long in the forewing, 5 in the hind ; *ab* entirely absent in all wings.

Abdomen black, marked with blue as follows :—a large, subtriangular spot on the sides of segment 1 ; a streak on the lower part of the sides of segment 2 and a triangular, apical, subdorsal spot ; segments 3 to 5 have small, dorsal, basal spots, segments 9 and 10, which are strongly keeled, are entirely blue except for the extreme lower edge.

Anal appendages. Superior broad at the base, truncate afterwards and somewhat quadrate at the ends when viewed in profile, furnished below at the apex with a robust, black spine ; viewed from above they appear to be triangular and conical, purplish blue ; inferior broad at the base, tapering rapidly, the ends curling in and overlapping one another slightly, white tipped with black.

Female. Abdomen 28 mm. Hindwing 18 mm. Postnodals to forewing 16.

Very similar to the male, but the blue markings more restricted and less purplish in hue. The antehumeral lines very narrow and the lateral more so than in the male.

The sides of the abdominal segments 3 to 5 show indications of a fine blue line surmounting a paler brown area ; segments 8 and 9 have a continuous blue, lateral line and a dorsal streak of blue which expands abruptly at the apex, but does not extend as far as the apical border ; in either segment this marking is shaped like a vase with a long neck ; segment 10 has a quadrate blue spot on the dorsum.

Anal appendages blue, as in the male.

Habitat. As for *C. nigra.*

Type (male) in the Pusa collection.

Note. I am doubtful as to whether species of *Caconeura* which have entirely lost the nervure *ab* should not be placed in a genus of their own. I have examined large numbers of *Caconeura* and, where *ab* is vestigial, have always found it present in all wings. On the other hand I have never found a vestige of *ab* in any wing of a species where it is normally absent. This feature seems to be constant in species, *ab* either being present in its entirety as in *Disparoneura*, as a vestige as in *Caconeura*, or absent entirely as in the present species.

Caconeura botti, sp. nov.

Several males from King Island, Mergui, Burma, 4th June 1921, collected by J. R. Elton Bott.

Male. Abdomen 31 mm. Hindwing 19 mm.

Head black traversed above by a broad band of azure blue at the level of the ocelli ; the cheeks, lateral lobes of labrum and labrum are also blue, but the base of the latter is black ; eyes pale blue or greyish blue, the upper half capped with brownish black.

Prothorax black, the posterior lobe and a large subdorsal spot azure blue. The posterior lobe is very large but simple.

Thorax black marked with very broad, triangular, antehumeral, azure blue bands which are rounded below and taper towards the alar sinus ; laterally there is a moderately broad, blue stripe and the lower, posterior part of the metepimeron is of a paler whitish blue ; beneath white.

Legs black, paler at the bases of the femora and coxæ.

Wings faintly enfumed : stigma lozenge-shaped, black, braced ; postnodal nervures in forewing 16 to 17, in the hind 14 ; *ab* vestigial and enclosing with the posterior border of the wing a very small marginal cell.

Abdomen black ; segment 1 with a spot of pale blue at the side ; segment 2 with a stripe of the same colour on the side followed by a paler spot at its apical end ; segments 3 and 4 with small, basal, dorsal, pale blue spots ; the remainder black.

Anal appendages of the usual generic shape, but the inferior longer than usual and more tapering, the extreme apices being slightly upturned. The superior azure blue and apparently serving as recognition marks ; the inferior white tipped with black.

Female unknown.

Habitat. Collected on the banks of a running stream in a three-year old rubber plantation.

Type in the Pusa collection.

Caconeura nigra, sp. nov.

Two males from King Island, Mergui, Burma, 4th June 1921, collected by J. R. Elton Bott.

Male. Abdomen 28·5 mm. Hindwing 18 mm.

Head, prothorax, thorax, legs and abdomen entirely black save for some paired, tiny, white, basal, dorsal points on segments 3 to 6.

Wings hyaline : stigma black, braced ; postnodal nervures to forewing 15, 13 in the hind ; Cu_2 in the forewing 5 cells long, 4 in the hind ; *ab* vestigial, very small and enclosing a correspondingly small marginal cell.

Anal appendages of the usual generic shape but stouter and shorter than usual and the inferior spine of the superior appendages situated near the base ; black.

Habitat. As for *C. botti*, which it much resembles except for the markings which are singularly lacking in this insect. The postnodal nervures are also fewer in number.

Type in the Pusa collection.

Caconeura autumnalis, sp. nov.

Four males from the western edge of the Ward Lake, Shillong, 13th October to 16th October 1919, collected by T. Bainbrigge Fletcher. Female unknown.

Male. Abdomen 26 mm. Hindwing 17 mm.

Head entirely black ; eyes pale brown capped with a darker zone of brown and an equatorial belt of the same colour which runs horizontally around the eyes.

Prothorax black, a little paler on the lower part of the sides.

Thorax black with two lateral, obscure, smoky brown stripes on each side and a spot of the same colour on the extreme posterior corner of the metepimeron.

Wings hyaline : stigma black ; postnodal nervures to the forewing 13 ; *ac* situated midway between the antenodal nervures ; *ab* incomplete and ending on the posterior border of the wing so as to enclose a marginal cell ; Cu_2 4 cells long in the forewing, 3 cells in the hind.

Abdomen black marked with pale brown and white as follows :— segment 1 with a pale brown, diffuse spot at the apical border below and an apical ring of white ; segment 2 has a dirty brown stripe low down on the side ; segments 3 to 7 have white, dorsal, basal lunules separated finely by the dorsal carina, and segments 3 to 6 have in addition pale, brownish, lateral, subapical, diffuse spots ; the remaining segments entirely black.

Anal appendages about the length of segment 10, of the usual generic type, black ; the apices of the inferior appendages creamy white.

Habitat. Concerning this species Mr. Bainbrigge Fletcher makes the note that it resembles *Pseudagrion rubriceps* in habits and that it hovers over the water.

Disparoneura campioni, sp. nov.

One male collected by T. Bainbrigge Fletcher at Margherita, 14th May 1920. One male from Kashgar (C. M. Inglis coll.)

Abdomen 31 mm. Hindwing 20 mm.

Head. Eyes bluish ; labrum pale blue, its base and the epistome with a broad transverse, black bar ; rest of head black except for the cheeks and a broad bar traversing the occiput which are sky blue.

Prothorax black with a lateral band of pale blue.

Thorax black on the dorsum marked with a narrow, blue, humeral stripe, blue on the sides marked with a black stripe on the second lateral suture. Legs pale, the femora stripde longitudinally with black on the extensor surface.

Wings hyaline ; the stigma black, covers one cell, its outer and posterior border somewhat rounded ; arc distal to the second antenodal nervure.

Seventeen postnodal nervures in one forewing, 15 in the other, 14 in both the hindwings. Cu_1 4 cells long in the forewing, 5 in the hind ; *ac* nearer the second antenodal ; *ab* complete ; Cu_2 absent.

Abdomen black marked with blue as follows : the sides of segment 1 ; a tadpole-shaped mark, the tail directed back on the dorsum of the second segment ; fine blue, basal annules to segments 3 to 7, and large, bright blue, recognition marks on the dorsum of segments 8 to 10 ; on segment 7 the blue covers less than the apical third, and on 9 it is encroached upon on either side at the base.

Anal appendages very similar to type but the inferior are rather more prolonged than usual and tapered ; their ends curl in and back and resemble two approximating hooks.

This insect bears a striking resemblance to *Indoneura gomphoides*, but its much smaller size will alone serve to disitnguish it and the blue markings separate it from all other Indian *Disparoneuras*.

Type in the Pusa collection.

Genus *Esme*, gen. nov.

Closely allied to genus *Disparoneura*, but considerably larger than any of the species belonging to that genus. Wings more densely reticulated and in this respect resembling *Indoneura*, from which it is separated by the nervure *ab* being complete instead of abbreviated and curving back to join the posterior margin of the wing. Cu_1 of much greater length than in *Disparoneura* and in the hindwing reaching nearly to the middle of the wing. Posterior lobe of prothorax of the female simple.

With the discovery of this genus it is possible to construct a probable line of descent of the Indian genera belonging to the Legion *Protoneura.*

Phylloneura (*P. westermanni,* Selys.)

Indoneura (*I. gomphoides,* Ramb.) — *Caconeura* (*C. dorsalis,* Selys.)

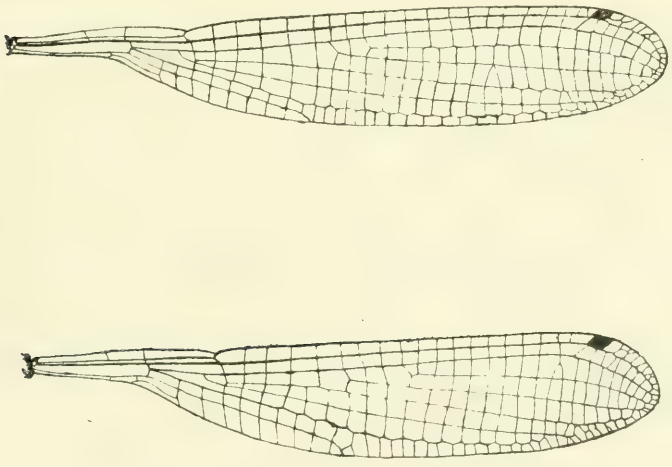
Esme (*E. cyaneo-vittata,* Fras.) — *Disparoneura* (*D. frenulata,* Selys.)

Phylloneura is undoubtedly the oldest of the five genera, the rudimentary intercalated sectors pointing to a very primitive type. *Indoneura* and *Esme* are both respectively more archaic than *Caconeura* and *Disparoneura* on account of their more dense reticulation and great length of Cu_1, whilst the formation of *ab* suggests a strong relationship between *Indoneura* and *Caconeura* and *Esme* and *Disparoneura* respectively.

Esme cyaneo-vittata, sp. nov.

Numerous specimens of both sexes, Kodaikanal, Palni Hills, collected by T. Bainbrigge Fletcher, during August 1921.

Male. Hindwing 30 mm. Abdomen 40 mm.
Female. Hindwing 31 mm. Abdomen 42 mm.
} Postnodal nervures forewing 21 to 22.



Wings of *Esme cyaneo-vittata.* (× 2½).

Both male and female are marked and coloured exactly as in *Indoneura gomphoides,* Rambur. In size they resemble *Indoneura ramburi,* Fraser.

Distinguished from the two latter species by the nervure *ab* being complete as in *Disparoneura*.

Subfamily Cœnagrioninæ.

Pseudagrion williamsoni, sp. nov.

Two males from King Island, Mergui, Burma, 4th June 1921, collected by J. R. Elton Bott.

Male. Abdomen 23 mm. Hindwing 18 mm.

Head. Eyes pale green or yellowish green with the extreme summit capped with dark brown ; labium a dirty white ; labrum citron yellow ; epistome and frons a greenish yellow ; rest of head blackish brown marked with a pair of very large triangular, postocular, turquoise blue spots and a short narrow line of greenish yellow bordering the occiput.

Prothorax. Anterior and posterior lobes turquoise blue, the middle lobe black, this colour enclosing a small lateral spot and a middorsal, geminate spot of blue.

Thorax black on the dorsum, deep sky-blue on the sides ; a pair of rather broad, pale greenish blue, humeral bands on the dorsum and two small, black points on either side.

Legs white, striped longitudinally with black.

Abdomen. Segments 1, 2, 3, 8, 9 and 10 deep sky-blue, the remainder pale greenish-blue, all marked with black as follows :—segment 1 has a basal quadrate spot with its apical margin slightly rounded and not reaching the apex of the segment and also a fine, subapical annule ; segment 2 has an oblong, rectangular spot on the dorsum, not reaching the base of the segment but connected with an apical annule by a short medial stem ; in its centre and nearer the base, this spot encloses a small, triangular spot of blue ; segments 3 to 7 have broad, longitudinal bands of black which expand subapically and then contract again before joining apical annules, except on segment 7 where the band gradually dilates as far as the apex ; segments 8, 9 and 10 are an intense violet blue, 8 and 9 having broad, black, apical annules, which cover not quite one-fourth of the dorsum of segment 8 and fully one-fourth of segment 9 ; segment 10 has a broad, black, dorsal mark extending from the base to the apex and narrowing towards the latter which is notched dorsally, and has a blue recognition mark lying between the two superior anal appendages.

Superior anal appendages truncate, strongly bifid at the apex, almost as long as segment 10, black. Inferior appendages very short, conical, white with a minute black point at the apex.

Wings hyaline ; stigma brown ; postnodal nervures to forewing 11, in the hind 9 to 10.

Female unknown.

Habitat. Swamp and running stream in three-year old rubber plantation. This species resembles *P. rubriceps* closely in its colouring and markings but has no red colouring on the head and the anal appendages differ widely. The dorsal marking on segment 2 closely copies that found on the same segment in the female of *P. rubriceps*. This marking and the black apical annules on segments 8 and 9 will serve to distinguish it from all other Indian species of the genus.

Type in the Pusa collection.

Pseudagrion spencei, sp. nov.

Several males and females from Pusa, Bihar, in March 1920, and Gauhati in September 1920, collected by T. Bainbrigge Fletcher.

Abdomen 24 mm. male, 25 mm. female. Hindwing 15 mm. male, 16·5 mm. female.

Male. Head. Labrum and epistome pale greenish blue, rest of head black save for large, pale blue, postocular spots.

Prothorax black on the dorsum, marked with a medial geminate spot of blue and a subdorsal, larger, similarly coloured spot. The sides pale blue. Thorax black on the dorsum, marked with narrow, blue, humeral stripes. The sides blue, the second lateral suture narrowly black.

Legs whitish, including tibiæ, the femora striped on the extensor surface with black.

Wings hyaline, the stigma black ; quadrilateral of hindwing distinctly broader than that of the fore ; 8 to 9 postnodal nervures in the forewing, 7 to 8 in the hind.

Abdomen blue marked broadly with black. The first segment with a small, quadrate, dorsal spot, the second with an elongated, thistle-shaped spot connected up with an apical, narrow annule ; third to seventh segments with broad, dorsal stripes which expand in the usual manner at the apex and then contract again before joining with the narrow apical ring ; this dorsal band is broader and not constricted apically on the seventh segment ; the eighth and ninth segments are all blue except for an apical row of black spines ; the tenth segment with a quadrate, black spot on the dorsum.

Anal appendages black, the inferior somewhat paler or whitish; the superior bifid in profile at the apex, about as long as the tenth segment, without a basal, apical spine; inferior very small.

Female. Head ochreous, unmarked, the postocular area olivaceous. Eyes brownish.

Prothorax ochreous with fine, transverse, irregular, black streaks across the middle and posterior border.

Thorax ochreous marked with three fine, parallel, black lines on the middorsum and a fine, humeral line of the same colour.

Legs pale yellow, the femora marked with black on the extensor surface.

Wings hyaline, the stigma yellowish. Ten postnodal nervures in the forewing, 8 in the hind.

Abdomen bright ochreous, almost reddish on the dorsum, marked with black as follows:—first segment touched with it dorsally at the extreme base, second segment with a fine, middorsal streak of black extending only for the basal three-fourths and ending with a short, transverse streak at either extremity –the whole shaped like an attenuated dumb-bell; third to sixth segments with small, subapical, black, transverse spots, and very fine, apical, black annules; seventh with a fine, middorsal, black streak connected with a transverse, short streak near the apex; eighth with a broader streak, broadening apically; ninth with a still broader streak tapering apically; the tenth unspotted.

Anal appendages conical, ochreous.

Pseudagrion spencei is closely allied to *P. laidlawi*, but the ground colour of the male will serve easily to distinguish it and the meagre character of the black markings on the abdomen of the female form a marked contrast with the broad ones of *laidlawi*. These markings vary within limits in the female of *spencei*, but they are never more than a very fine, dorsal streak and, more often than not, this is absent on segments 3 to 6. The type specimen is a female from Shillong, 28th September 1920, collected by T. Bainbrigge Fletcher and which I had taken to be the female of *P. bidentatum*. The male is from Pusa, March 1920.

Pseudagrion laidlawi, sp. nov.

Six males and eight females from Karachi, Sind, 8th September 1919. (Type in my own collection.) Two males and two females from Nagpur, 18th December 1919, collected by T. Bainbrigge Fletcher.

Male. Abdomen 25 mm. Hindwing 16 mm.

Head. Eyes violaceous or bluish ; frons, epistome and labrum pale blue ; vertex pale lilaceous bordered in front by a narrow, black band at the level of the middle ocellus and edged outwardly, behind, by a black band.

Prothorax pale lilaceous, black on the dorsum where two wedge-shaped spots of the ground colour are enclosed.

Thorax lilaceous marked on the dorsum with three moderately broad, black stripes, one middorsal, the others humeral.

Abdomen pale blue with a violaceous tinting especially on the tenth segment ; the eighth and ninth segments are however a deeper sky-blue. Marked with black as follows :—first segment with an apical, narrow and a basal, broad spot ; second with a large, thistle-shaped spot on the dorsum, the stalk connected with a narrow apical ring ; third to seventh with broad, dorsal stripes widening apically ; eighth with a very small, basal spot and an apical row of black spines : ninth with only a row of apical, black spines ; tenth with an X-shaped spot on the dorsum.

Legs pale blue, almost white. The extensor surfaces of femora striped with black.

Anal appendages blackish externally, whitish internally, hollowed out, bifid at the apex, the upper arm of the bifurcation being the longer. No basal spine as in the other members of the genus.

Female. Abdomen 25 mm. Hindwing 17 mm.

Head pale violaceous brown, unmarked ; eyes green.

Prothorax pale violaceous brown with no markings. Two small, dorsal spines on the posterior lobe, directed forward.

Thorax similar in colour and marked with three very fine black lines on the middorsum.

Abdomen. Ground-colour of the first two and the last three segments lilaceous, the other segments pale green, marked with black as follows :—first segment with a basal, black spot ; second with an attenuated, thistle-shaped spot on the dorsum ; broad, dorsal, black stripes on the dorsum of all the others except the tenth which is unspotted ; the apices of all segments bearing narrow, black annules.

Wings hyaline. Forewing with eight postnodal nervures.

P. laidlawi differs from all other Indian species of the genus by the peculiar ground-colouring, by the anal appendages not having a basal spine, by only having eight postnodal nervures instead of 10 and 11 as in *P. microcephalum*, and *P. bengalense*, respectively. The differences between it and *P. spencei* have already been mentioned above. It is very closely allied to the latter species.

Type in Major Fraser's collection.

[Also from Pusa, 30th October 1920, T. B. F.]

Indagrion, gen. nov.

Closely allied to *Mortonagrion* and less closely to *Agriocnemis*. Prothorax of female simple. Arc well distal to the second antenodal nervure ; *ab* present and meeting *ac* which lies about midway between the two antenodals ; *ab* is continued outward in the same straight line as Cu_2 and not meeting at an angle ; quadrilateral of forewing much stouter and shorter than that of the hind, both acutely pointed.

Female without a ventral spine.

The chief difference between *Mortonagrion* and *Indagrion* is that in the former there are three cells between the quadrilateral and the level of the subnode, whereas in the latter there are only two.

Genotype : *Indagrion gautama*, Fraser.

Indagrion gautama, sp. nov.

A single female from Sadiya, 23rd May 1920, collected by T. Bainbrigge Fletcher.

Abdomen 24·5 mm. Hindwing 16·5 mm.

Head black above, the labrum with a basal greenish blue stripe. A large pale blue postocular spot on either side of the occiput.

Prothorax black above, pale blue at the sides.

Thorax greenish blue with the dorsum broadly black and a broad, humeral and a very narrow, lateral stripe of the same colour. The black appears to enclose a greenish-blue humeral stripe.

Wings hyaline ; 9 postnodals in the forewing, 7 in the hind. Stigma rather elongated, blackish.

Abdomen greenish-blue, marked with black as follows :—first segment with a broad, subtriangular patch on the dorsum, not reaching the apex of the segment ; second segment with a thistle-shaped mark on the dorsum, connected with an apical ring of black ; segments 3 to 7 all with a broad, dorsal stripe which first widens and then contracts again to join the apical black ring ; segments 8 to 10 all black, except for a small, blue annule between 8 and 9.

Legs black, tibiæ paler and possibly pale blue in life.

There is no ventral spine on the eighth segment, which serves to separate the insect from *Ischnura* and *Enallagma*.

Type in the Pusa collection.

Aciagrion azureum, sp. nov.

Abdomen 30 mm. Hindwing 20 mm.

A single male from Margherita, Assam, 18th May 1920, collected by T. Bainbrigge Fletcher. Very similar to *Aciagrion olympicum*, Laid., but differs in the colouring of the head and the venation of the wings.

Head. Labrum pale yellowish; epistome traversed by a transverse, black band; face and cheeks pale yellow, rest of head black except for very large, blue, postocular spots. (In *olympicum* the postocular marking is a transverse streak meeting across the occiput.)

Prothorax black on the dorsum, pale blue on the sides.

Thorax black on the dorsum, marked with fine, blue, humeral stripes. Sides blue, changing to creamy yellow low down on the sides.

Wings hyaline, stigma brownish. Postnodal nervures 11 and 10 respectively in the right and left forewings, 9 in the hind. (These number 13 in the forewing, and 11 in the hind in the wings of *A. olympicum*.)

Abdomen with the ground-colour of the first two segments and the last three blue. Segment 1 has a large, quadrate, black spot on the dorsum not reaching the apex of the segment, 2 has a broad, thistle-shaped mark on the dorsum, and segments 3 to 7 broad, dorsal, black stripes which enlarge abruptly at the apical end and then contract again to meet fine, black, apical rings; on segment 7 the stripe is broader and tapers gradually from the apex to base; segments 8 to 10 are unmarked.

Anal appendages are small and very similar to those of *A. olympicum*; the superior are, however, more conical and not bifid as seen in profile; black in colour.

Type in the Pusa collection.

Enallagma parvum, Selys.

Female. Abdomen 17 mm. Hindwing 12 mm.

The female described below was taken by myself at Parel Tank, Bombay, March 1917. (This specimen was being devoured by a male *Crocothemis servilia*.) Other specimens from Poona, September-October 1918. Mr. Bainbrigge Fletcher has taken specimens at Nagpur, 18th December 1919, and at Pusa, 30th December 1919. I have had a single specimen sent to me from Simla which differs from the others by not possessing humeral bands, and have seen two other similar specimens recently. It is therefore a dimorphic insect.

Very similar to the male but stouter in build. Markings similar but broader, especially on the abdomen where the dorsum is entirely black except on the tenth segment which is usually unmarked.

Ground-colour pale blue or bluish green, the dorsal surface suffused with yellow. Thorax usually pale yellow deepening dorsally between the black markings. The postocular spots connected by a fine yellow band.

In the Simla specimen, the head, posterior to the black band traversing the vertex, is entirely pale blue or blue edged posteriorly with yellow and there are no black humeral bands. The labrum is unmarked in this specimen but in the other specimens it bears a black spot.

The eighth abdominal segment bears a ventral spine.

Females of *E. parvum* are rarely seen, even where the male is in great numbers, and those taken are almost invariably *in cop.* Apparently they only emerge from their hiding places when pairing.

Agriocnemis d'abreui, Fraser. (Plate VI, fig. 1.)

Rec. Ind. Mus., XVI, p. 454 (1919).

Several males and females from Gauhati, Assam, 14th November 1919, and from Tokhlai, Jorhat District, Assam, 23rd November 1919, collected by T. Bainbrigge Fletcher.

The female was described from a solitary specimen taken by Mr. E. A. d'Abreu at Lamta, Balaghat District, Central Provinces, 23rd March 1919. The male has not yet been described.

Male. Head : labrum blue with a black streak traversing it, which encloses two minute spots of the ground-colour, a narrow black streak at the base of the frons which is a pale blue ; eyes black in the upper third, blue in the middle, fading to pale green below. The rest of the head black except for small, blue, postocular spots connected across the middle line by a fine yellow band.

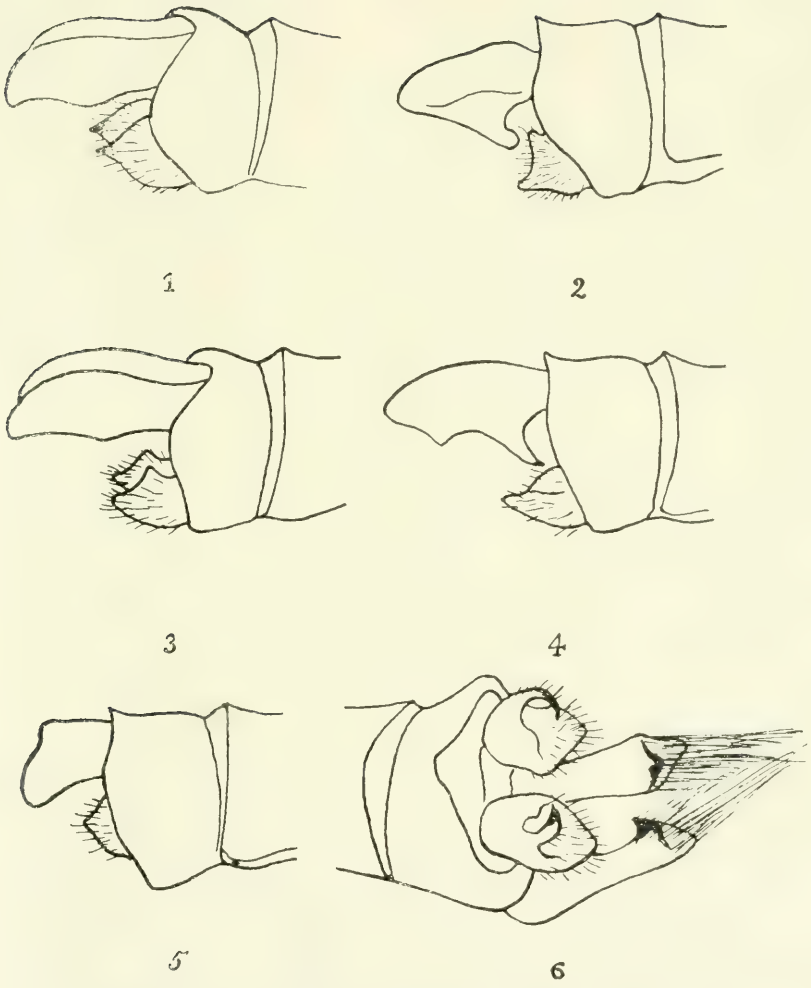
Prothorax black above, blue at the sides and narrowly along the free border of the posterior lobe which is rather prolonged.

Thorax black on the dorsum, traversed by a fine, blue, humeral line on either side, the lateral blue fading to pale yellow below.

Legs white marked with black streaks on either side.

Wings : 5 to 6 postnodals in the forewing. Stigma pale brown.

Abdomen blue with a greenish tinge and changing to yellow or bright ochreous on the last four segments ; marked with black as follows :—the whole of the dorsum of the first segment ; a large mark



ANAL APPENDAGES OF SPECIES OF *AGRIOCNEMIS*.

1.	Anal appendages of *A. d'abreui*,	lateral view,	Original.
2.	,, ,, ,, *A. nana*,	,, ,,	After Laidlaw.
3.	,, ,, ,, *A. splendidissima*,	,,	Original.
4.	,, ,, ,, *A. clauseni*,	,, ,,	,,
5.	,, ,, ,, *A. pygmæa*,	,, ,,	,,
6.	,, ,, ,, *A. incisa*,	seen from below,	,,

on the dorsum of the second segment, contracted in two stages posteriorly and with two blue enclosures in the fore part (this marking strongly reminds one of the pair-of-spectacles marking on the hood of a cobra) : a black streak on all of segments 3 to 6, incomplete basally, expanding apically and then contracting again just before the extreme apex, where it joins an apical, black annule ; the seventh to tenth segments bear more or less obscure, browny black markings made up of a central stem and lateral branches which arise apically and run for a short distance forward.

Anal appendages very long and narrow (Plate VI, fig. 1). The superior longer than the tenth segment, elongated, parallel-sided, slightly curved in a downward direction and with a blunt apex, ochreous marked with black externally and apically. The inferior very small, foliate, cordate, pale green, with a small, shiny black point at the apex. There is no accessory armature to the superior appendages as in *A. nana* and *A. clauseni* (Plate VI, figs. 2 and 4). They resemble the appendages of *A. splendidissima* Laid., to which the insect is closely allied Plate VI, fig. 3).

Length of hindwing 9 to 9·5 mm., of the abdomen 13 to 14 mm.

A study of the new material reveals the fact that there is considerable variation in the colouring of the females which appears to be dependent on the age of the specimens.

The colour of the thorax is more often black than blue and there is a narrow, creamy, humeral line on either side which may be well defined or partly or entirely obsolete. The sides are blue or greenish blue but the black may extend down so low as almost to obscure this colour, especially in very adult specimens.

On the abdomen the black markings are extremely variable. In the young specimens the lateral markings are entirely wanting In the very adult, these markings are so extensive that they largely blot out the ground-colouring of the first three and the last three and the greater part of the seventh segments, leaving only small traces of blue.

Postnodal nervures vary in the female from 6 to 8, and the length of the hindwing from 10 to 12 mm. Length of abdomen 15 to 16 mm.

Habitat. Found in similar situations to those of *A. pygmæa.*

Agriocnemis clauseni, sp. nov. (Plate VI, fig. 4.)

A number of males and females from Shillong, Assam, collected by T Bainbrigge Fletcher, during the middle months of 1918, and from August to October 1919. [Also from Margherita and Gauhati.—T. B. F.

I had referred this species to *Agriocnemis nana*, Laid., to which the insect bears a close resemblance. Dr. Laidlaw gives the measurements of his species as hindwing 9 mm., abdomen 18 mm. This ratio is very unusual and excessive so that a printer's error may have crept in. Apart however from the size, *A. nana* has only 6 postnodals in the forewing, whereas *A. clauseni* has 9.

The colouring is the same in the two species and the markings are almost identical, differing as follows :—

Head : the labrum is black, the frons blue. The postocular space bears a large, blue, comma-shaped mark enclosed in the black and is not entirely blue as in *A. nana*. (In a very young specimen, the space would probably be entirely blue.)

The prothorax has a narrow blue collar anteriorly and there is a small, boomerang-shaped spot, blue, low down on each side.

The thoracic humeral stripes tend to taper from before backwards. The lower edge of the black has one or two marked dentations and there is an additional patch of black just posterior to the hind coxæ. The under surface is black.

The abdominal markings differ only in the terminal segments : on the seventh the black marking expands on the basal third, then narrows abruptly to a thin middorsal line and finally expands again to cover the whole of the apical fourth ; the eighth to tenth segments are entirely black, the ninth not having the lateral blue spot ; segments 3 to 6 have sublateral bands which meet apically with the dorsal band to enclose a small blue spot.

The anal appendages agree closely with the figure and description given by Dr. Laidlaw (Plate VI, fig. 4). The colour is the same but the ventral spur on the superior organs is sharply acute and strongly curved.

The female of *A. nana* is unknown ; the following is a description of that of *A. clauseni*.

Exactly similar to the male except for the abdominal markings which differ as follows :—the first two segments have a small, black, lateral spot on each side ; the dorsal marking on the second segment is much broader and the two spots of enclosed blue, seen in the male, are absent ; the third to sixth segments have only broad, dorsal bands and there is no enclosed blue spot at the apex ; the dorsal band on the seventh segment is of even width throughout.

A. splendidissima, Laid., *A. nana*, Laid., *A. d'abreui*, and *A. clauseni* bear very similar facies and form a very natural group. In all, the superior anal appendages are of comparatively great length and much longer than the

inferior. The three latter species all bear the highly characteristic and specialized marking on the dorsum of the second abdominal segment and there is a suggestion of it even in the first-named. The anal appendages of *A. splendidissima* and *A. d'abreui* are almost identical and the same comparison applies to the other two species.

Type (male) of *A. clauseni* in the Pusa collection.

Subfamily Platycneminæ.

Melanoneura, gen. nov.

This genus belongs to Selys' "Legion IV," as restricted by Laidlaw.

Ab is absent ; Cu_1 extends for only 7 cells in the hindwing ; Cu_2 is absent ; supplementary basal postcostal nervure absent ; stigma rhomboidal. Prothorax simple. Legs with long cilia.

Genotype : *Melanoneura bilineata*, Fraser.

Melanoneura bilineata, sp. nov.

A single specimen, male, with the last four abdominal segments missing, collected by Rao Sahib Y. Ramachandra Rao, at Sidapur, Coorg, 25th April 1917.

Abdomen 23 mm. (this measurement does not include the last four segments). Hindwing 23 mm.

Head. Labrum metallic blue, cheeks pale blue, rest of head black.

Prothorax black on the dorsum, pale yellow at the sides.

Thorax broadly black on the dorsum, marked with humeral, blue stripes which are incomplete below and above, not reaching the alar sinus. Sides pale yellow marked with a fine, black line on the second lateral suture.

Wings hyaline ; stigma black ; postnodals in forewings numbering 20, in the hind 18.

Abdomen pale yellow ; the first segment unmarked ; all others marked on the dorsum with a broad, black band, darkest at the apex and diffusing towards the base where are found fine, basal annules. The last four segments are unfortunately missing so that the shape of the anal appendages is uncertain.

Legs very characteristic ; reddish orange marked with three broad, black annules, one at the distal end, one at the middle and the other near the base.

Venational characters separate this insect from *Cœliccia*, which it resembles superficially and for which I at first mistook it.

Type in the Pusa collection.

Pseudocopera, gen. nov.

Antennæ as for *Copera*; prothorax of female with a trilobed posterior lobe, the two lateral lobes very much smaller than the central division.

Abdomen very long and very slender; appendages highly specialized.

Sectors of arc fused, the arc distal to the second antenodal nervure; stigma nearly as broad as long. Petiolation begins proximal to *ac*; *ab* present; Cu_2 extending far beyond the middle of wing. Posterior and middle pairs of tibiæ greatly dilated and with very long cilia.

Differs from *Copera* by the shape of the prothorax of the female, by the shape of the stigma and by the length of Cu_2. Other features are the relatively large size of the insect and the shape of the anal appendages, which are more like those of a *Cyclogomphus* or *Onychogomphus* than *Copera*.

Genotype: *Pseudocopera arachnoides*, Fraser.

Pseudocopera arachnoides, sp. nov. (Plate VII, fig. 4.)

Two males and three females from Margherita, collected by T. Bainbrigge Fletcher, 14th to 19th May 1920.

Male. Head: labrum and cheeks yellowish, the former narrowly bordered with black at the base. Rest of head black except for an oval, yellow spot bordering the eye posteriorly and a small, similar coloured spot on the rear of the occiput. Eyes brown. First segment of antenna and the tip of the second segment pale yellow.

Prothorax black, marked with a longitudinal, yellow stripe on the subdorsum.

Thorax black, the sides yellow, the second lateral suture finely black; a narrow, yellow, humeral stripe on each side.

Legs very long and spidery, white. The distal ends of the femora, the extensor surfaces of the anterior tibiæ, the tarsi and the spines black. The four posterior tibiæ are widely dilated and serve the purpose of recognition marks very much the same as in numerous species of *Rhinocypha*.

Abdomen black, the sides of segments 1 and 2 with narrow, basal annules interrupted narrowly on the dorsal carina, and the basal three-fourths of segment 9 and the whole of segment 10 yellow. Beneath pale brown.

Anal appendages yellow, a spine on the superior and the apical half of the inferior black. Superior conical, nearly as long as segment 10 with a basal, inferior, black tooth. Inferior much stouter, nearly twice the length of the superior, curving strongly downward, tapering gradually and with the ends slightly approximated. The superior are directed strongly upward so that, seen in profile, the appendages are markedly divaricate.

Wings hyaline ; stigma yellowish brown, the centre darker and the bordering nervure dark brown. Postnodal nervures to forewing 15, 12 to 13 in the hind. M_{1a} 6 cells from the stigma in the forewing, M_1 10 cells.

Length of abdomen 40 mm., of hindwing 24 mm.

Female very similar to the male but differing as follows :—abdomen 38 mm., hindwing 24 mm. A black spot on the labrum and a black, transverse streak on the epistome. The legs entirely reddish yellow, except the tarsi which are brownish. Only the apical border of segment 9 and the whole of segment 10 yellow. The sides of segments 1 and 2 and the interrupted basal annules are yellow as in the males. Segment 10 is raised dorsally into a prominent ridge, much the same as in *Ischnura*. Anal appendages conical, yellow.

Wings with 14 to 16 postnodal nervures in the fore, 13 in the hind.

Type (male) and co-type (female) in the Pusa collection.

Subfamily. Lestinæ.

Indolestes, gen. nov.

Wings closed over dorsum during repose ; petiolated as far as the post-costal nervure (*ac*) ; M_2 arising $3\frac{1}{2}$ cells from the node in the forewing, $2\frac{1}{2}$ in the hindwing (5 in both wings of *Indolestes gautama*) ; *Ms* slightly angulated ; M_4 undulated at the level of the node ; stigma three times as long as broad, its outer border not oblique, over 2 to 3 cells ; quadrangle about one-third longer in the hindwing than in the forewing ; inner side of quadrangle of forewing only one-third the length of the posterior side, that of hindwing only one-sixth the length ; posterior lobe of prothorax rounded, simple, not lobed.

In this genus I include a species described by Dr. Laidlaw (*Lestes* sp., Laid. *Rec. Ind. Mus.*, Vol. XIX, p. 161 ; 1920), *Indolestes indica*, and *Indolestes helena*. All bear a close resemblance to *Sympycna* but may be distinguished by the simple lobe of the prothorax and by the outer margin of the stigma not being oblique. Lastly, *Lestes bilineata*, Selys, must be considered as belonging to this compact little group, even though the male is as yet unknown.

Genotype : *Indolestes indica*, Fraser.

Key to the genus Indolestes.

1. Abdomen only 24 mm. in length ; dorsal bands on the second abdominal segment, broadest at the base and coalescent except at the apex .. .. *Indolestes buddha*, Laidl.
   Abdomen 30 mm. in length 2

2. Dorsal bands on the second abdominal segment incomplete at the middle of segment, the basal parts coalesced, the apical as two subtriangular spots which may or may not be confluent .. .. *Indolestes indica*, n. sp.
   Dorsal bands complete 3

3. Dorsal bands on the second abdominal segment coalescent only for a short space at the apex where they enclose a small, oval spot of the ground-colour.. *Indolestes helena*, n. sp.
   Dorsal bands on the second abdominal segment coalescent only at a point near the base or separated throughout .. .. .. *Indolestes bilineata*, Selys.

Indolestes indica, sp. nov.

Several males and females collected at and around Shillong by Mr. T. Bainbrigge Fletcher, 19th June 1920, 18th to 27th October 1919. ("Taken on bushes by side of stream." "A pair taken on a hill-top quite away from water." "All resting with wings folded over the back.")

Abdomen, male 30 mm., female 28·5 mm. Hindwing, male 19 mm., female 21 mm.

Male. Head pale brown, vertex, occiput and back of eyes black with a coppery reflection. A small, pale spot just behind and external to each lateral ocellus. The apical half of basal joint of antennæ and the basal half or three-fourths of the second joint pale brown, almost white.

Eyes bluish grey, striped from above down with five parallel, dark brown bars.

Prothorax pale brown at the sides, broadly black on the dorsum; posterior lobe rounded and of moderate size.

Thorax pale fawn, the dorsum matt black with a coppery reflection not amounting to metallic. The dorsal marking has two lateral prolongations, one above at the alar sinus and one about the middle of the dorsum, the former extending outwards to the humeral sinus and often overflowing it, but the latter stopping short of it. Posterior to the humeral sinus three small, elongate, brown spots which are occasionally metallic. Elongate black spots at the upper part of the first and second lateral sutures. The sides of the thorax are paler at the humeral suture and beneath and there are two diffuse, blackish brown markings beneath the metepimeron.

Legs black on the flexor surfaces, pale brown on the extensor.

Wings pale brown, uniformly enfumed. The stigma dark brown, bordered with blackish nervures except outwardly where it is edged with white or very pale brown and there is also a small white point at the inner, posterior angle. Postnodal nervures 12-13 in the forewing, 11-12 in the hind; quadrangle of hindwing rather more than one-third longer than that of the fore.

Abdomen pale brown, the markings subject to some variation owing to the variable size of the spots: first segment with a basal, black spot and a

medial, subcostal, small spot on each side ; second segment with a cordate spot at the base which may, however, be tapered apically at the middorsum and is then shaped like a wineglass with the base missing ; apically two subtriangular, subdorsal, black spots which may or may not meet across the middorsal line ; the basal spots are metallic green, the apical matt black and the dorsal carina between them is finely yellow ; third segment with a pair of pyriform, green metallic, basal spots and a pair of black, subtriangular spots which usually meet across the middle line ; these spots are repeated on the fourth to sixth segments but the spots diminish progressively from before posteriorly and on the fifth and sixth they are non-metallic ; seventh and eighth segments with long, black, broad, diffuse stripes tapering basally ; ninth segment with a pair of basal, triangular, subdorsal spots ; the tenth segment immaculate.

Anal appendages almost white, tipped with black. The superior directed posteriorly almost straight for rather more than the basal half and then curving inward until they meet, at which point they are again directed basalwards ; the two ends are in apposition and, viewed from above, they resemble the arms of a man about to dive ; viewed in profile, the ends of the appendages are tumid and turned down at an oblique angle, just anterior to which there is a stout, ventral spine, directed inwards ; externally the border presents some fine denticulations and the ends are tufted with hairs. Inferior appendages about half the length of the superior, broad at the base, tapering and divergent apically where they are tufted with longish hairs.

Female. Exactly similar to the male except that the stigma is paler, the node is somewhat thickened and the wings are more deeply enfumed. The marking on the second segment is broader and the apical and the basal spots are joined together, enclosing a small, oval, pale brown spot or longish streak at the apical end. Segments 6 to 9 are largely brownish-black on the dorsum and the sides. The posterior lobe of the prothorax is simple and rounded. The lower part of the sides and beneath of thorax are pruinescent white.

Dr. Laidlaw's *Lestes* sp., mentioned above, and which I have named *Indolestes buddha*, bears a strong superficial resemblance to the present insect. It differs as follows :—the size is smaller, abdomen of female only 23·5 mm., and hindwing only 19 mm., the small, dorsal spots on the head are absent ; the prothorax is entirely differently marked ; segment 1 has a square, dorsal spot, without a basal spot, and additional subdorsal spots. The markings on the dorsum of the second segment are very similar to those of *Indolestes indica*.

Type (male) and co-type (female) of *I. indica* in the Pusa collection.

Indolestes helena, sp. nov. (Plate VII, fig. 1.)

Four females and three males from Kurseong, 17th—27th Septembe 1920, collected by C. M. Inglis.

Male. (All the specimens are a little teneral and markings indefinite.)

Abdomen 32 mm. Hindwing 21 mm.

Head dark brown, unmarked, with a coppery reflection; labrum paler. Prothorax dark brown, the middorsum a little paler. The posterior lobe broadly rounded, simple.

Thorax broadly dark brown on the dorsum with a coppery reflection. The sides pale yellow marked with a moderately broad, dark brown stripe on the first lateral suture. Legs dark brown, the extensor surfaces pale yellow.

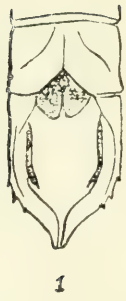
Abdomen pale brown marked with dark brown; first segment with a basal marking and an apical ring; second segment with two subdorsal stripes, narrow basally but broadening abruptly at the apical third where the two stripes enclose an oval spot of paler brown; segments 3 to 6 with subdorsal, wedge-shaped spots, which meet over the dorsum at the apex and gradually taper away diffusely at about the middle of these segments, and increase in size as traced towards the apex of the abdomen; segments 7 to 9 have the dorsum entirely dark brown, whilst 10 is unmarked and almost white in colour; the tenth segment deeply but narrowly notched in the centre. All markings are somewhat coppery and that on the second segment gives promise of becoming green metallic.

Anal appendages pale yellow. The superior as long as segment 9, straight in the basal half, then curving abruptly inward to meet each other, the apices being directed somewhat straight basalwards again for a very short distance; externally there are three or four small teeth and internally there is a fine, sharp, black spine directed back and a little downwards. The inferior are triangular, in close apposition and less than one quarter the length of the superior.

Wings very faintly enfumed with brown, the nervures brown. Very long and narrow, the apices rapidly narrowing after the stigma. The latter brown with a pale margin of yellow on the posterior and inner and outer borders. The outer margin not oblique, about three times as long as broad.

Female differing in the slightest degree from the male. The abdominal markings rather broader.

This species is distinguished from *Lestes bilineata*, Selys, by its long stigma, three times as long as broad (only twice as long as broad in



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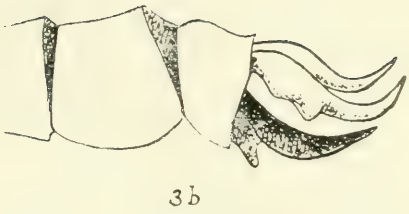

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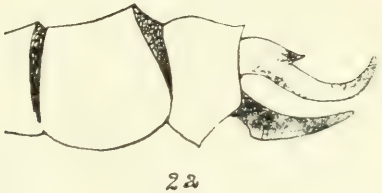

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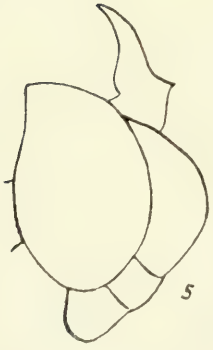

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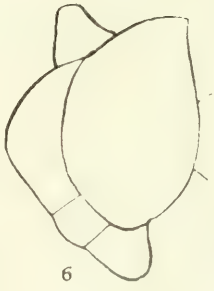

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1, Anal appendages of *Indolestes helena*, male ; 2, Anal appendages of *Leptogomphus spirillus* seen from above, male ; 2a, The same viewed from the side ; 3, Anal appendages of *Stylogomphus inglisi* seen from above, male : 3a, The same seen from below ; 3b, The same viewed from the side ; 4, Anal appendages of *Pseudocopera arachnoides*, male ; 5, Head of *Idionyx corona*, female ; 6, Head of *Idionyx ornata*, female.

bilineata), from *indica* also by the character of the stigma and also by the markings on the dorsum of the second abdominal segment. From *Indolestes buddha* it is distinguished by the much shorter length of the abdomen and also by the markings on the second abdominal segment.

Type (male) and co-type (female) in the Pusa collection.

FAMILY AGRIONIDÆ.

Subfamily Libellaginæ.

Rhinocypha beesoni, sp. nov.

Several males and females from Lachiwala, Dehra Dun District, collected by C. F. C. Beeson, 18th November 1920, and two pairs from King Island, Mergui, Burma, collected by J. R. Elton Bott, 4th June 1921.

Male. Abdomen 18 mm. Hindwing 25 mm. Greatest breadth of hindwing at its outer third, 5 mm.

Head black marked with five yellow spots, one on either side of the ocelli, reniform in shape and with the hilus facing inwards, and a row of three small, round spots on the occiput, one central and the others lateral.

Prothorax black with a violet spot low down on the side and the whole of the posterior lobe a beautiful cerise colour.

Thorax matt black, the carinal triangle, which extends for only about one-third upwards, and the carina itself cerise. On either side of the triangle, and considerably larger than it, is a posthumeral spot of pale purple, its inner margin straight and limited by the humeral suture, its outer strongly convex. At the apex of this spot is a small circular spot of the same colour and bordering on the anterior border of the first lateral suture is a narrow line of blue. Between the two lateral sutures is a very irregular stripe of pale blue and two isolated spots of the same colour, one of which is about the middle of the thorax, anterior to the stripe, and the other high up near the base of the hindwing. Finally, the anterior two-thirds of the metepimeron pale blue. Beneath the thorax is black marked with seven large spots of chrome yellow.

Legs black, the anterior coxæ and the mid femora yellow on the flexor surface. The hind tibiæ, which are a little expanded, are chalky white on the flexor surface.

Wings long and very narrow, the hind not markedly more so than the fore, hyaline, but slightly enfumed ; stigma black in all wings ; forewing with the apex as far as 2 to 3 cells proximal to the stigma dark brown, the inner margin of this dark area a little irregular, bevelled slightly outwards posteriorly and prolonged along the costa, as far as halfway between the stigma

and the node between the costa and radius. Posteriorly there is also a slight prolongation along the margin of the wing. Hindwing with the apex also, but much more broadly than the forewing, dark brown, this colour covering about the outer third of the wing, its inner margin convex and curving strongly basalwards posteriorly, its anterior margin prolonged inwards as in the forewing, marked with a single row of longitudinal, vitreous spots, the anterior three of which are only one cell deep, the fourth 3 cells deep and the fifth or posterior spot merely a single cell. In addition to these spots in the dark area, there is a row of three vitreous, longitudinal spots in the hyaline area, the posterior two of which are contiguous with the dark area and the anterior one separated from it by one or two clear cells. There is also another vitreous streak of 9 cells length situated about the middle of the wing with its inner end at the level of the node. In the dark area the vitreous spots are metallic green or coppery according to the angle from which viewed, in the hyaline area they are violet. Antenodal nervures to the forewing 14-15, postnodals 22-25. Only a single row of cells between Cu_2 and the posterior margin of the wing. Quadrilateral traversed 3 times in the forewing, 4 times in the hind.

Abdomen matt black marked with pale blue as follows :—the first segment with a large, subtriangular, lateral spot ; segments 2 to 5 with 2 parallel, longitudinal, lateral lines neither extending to the base or apex of the segment ; at the apical end of the superior line there is an isolated, rounded spot ; segments 6 to 9 have only the inferior line present but diminishing in length as traced apicalwards until it is finally absent on the tenth segment.

Anal appendages black, the superior rather longer than the tenth segment, the inferior shorter, very similar in shape to those of *R. bisignata.*

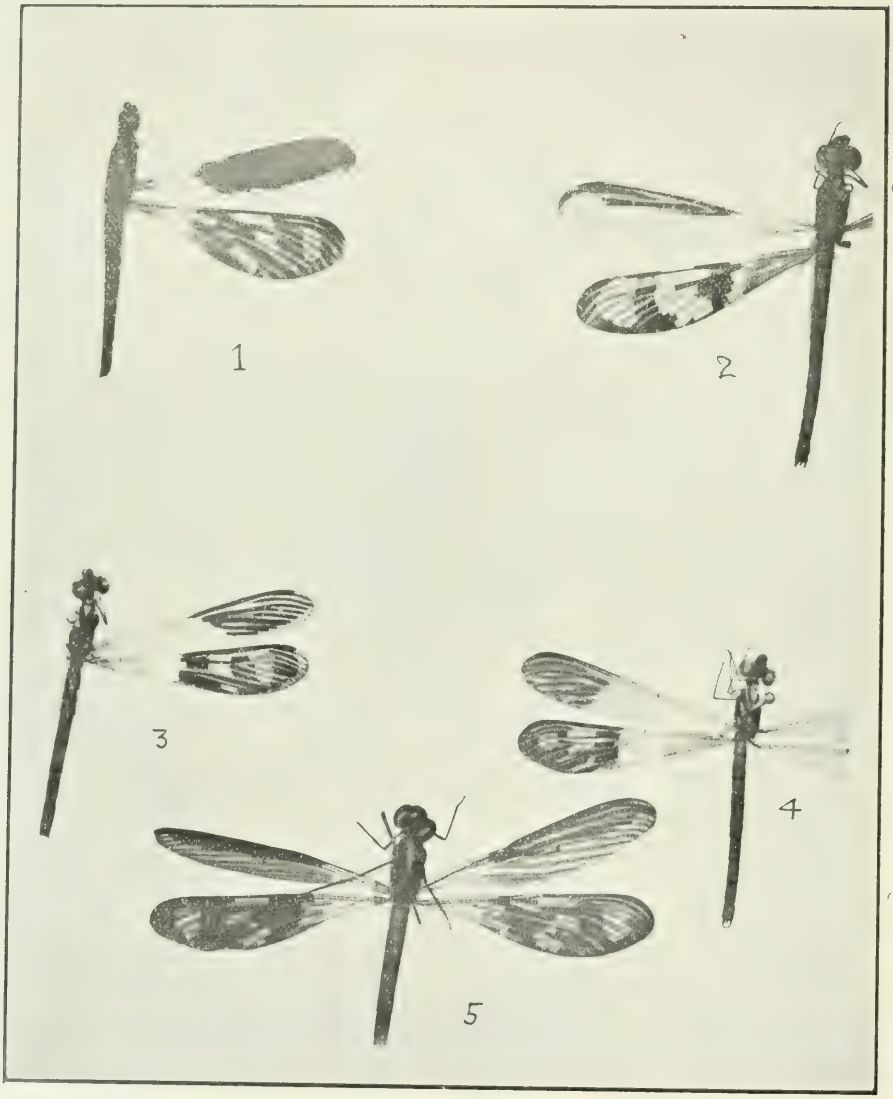
Female. Abdomen 16 mm. Hindwing 25 mm.

Closely similar to the female of *R. bisignata* from which it can scarcely be distinguished.

Head, in addition to the markings already noted for the male, marked as follows :—two spots at the base of the labrum, two just behind the epistome, the lateral lobes of the labrum, the basal joints of the antennæ, and a streak along the inner border of the eyes, chrome yellow.

Prothorax black with a lateral spot of yellow and a median line of the same colour incomplete on the middle lobe.

Thorax black, the carinal triangle, which is of the same size as in the male, outlined in yellow. A fine humeral line of the same colour incomplete on the upper half of the dorsum and curling out below to form a hook-like marking. The sides marked as in the male but yellow and the whole of the metepimeron of this colour except for a lower marginal streak of black.



1, *Rhinocypha quadrimaculata quadrimaculata*; 2, *R. bifenestrata*; 3, *R whiteheadi*; 4, *R. perforata perforata*; 5, *R. quadrimaculata hemihyalina.*

Legs black, the coxæ and posterior surfaces of the femora yellow.

Wings hyaline, more deeply enfumed than in the male but no dark areas or vitreous spots. Stigma dark brownish, paler in the middle.

Abdomen black marked with yellow, the markings being otherwise as in the male.

This species is interesting as having reached me from two rather widely separated areas within a week of each other. The two sets of insects show no differentiation whatever but the Burmese type is remarkable as being the first Indian species to be reported from sea-level or thereabouts. *R. beesoni* which has been named after Mr. C. F. C. Beeson, Forest Zoologist, Dehra Dun, its first discoverer, is very closely allied to *R. bisignata* and is apparently the northern representative of this latter insect : indeed, it is very probable that *R. bisignata* is a direct lineal descendant of it.

Rhinocypha bifenestrata, sp. nov. (Plate VIII, fig. 2.)

Two males from Mangpu, Darjiling District, 3,860 feet, 30th August and 3rd September 1920.

Abdomen 25 mm. Hindwing 27 mm.

Very like *R. trifasciata*. but differs in the wing markings.

Body, including the head, black without any markings save on the thorax. The latter with a long, mesothoracic triangle extending right up to the alar sinus and pale lilaceous in colour. Laterally there is an anterior yellow spot followed by a longitudinal stripe of the same colour.

Wings differ markedly from true *trifasciata*. The forewings have a dark, blackish brown fascia extending from the apex to a little proximal of the node and about one-third the breadth of the wing in depth. The posterior margin is jagged and the fascia widens rapidly and obliquely from the inner margin of the stigma.

The hindwings have an apical fascia extending inwards from about the middle of the stigma, a medial fascia situated about midway between the node and the stigma, and a basal, opposite the node, the basal margin of which is a little sinuous and the outer margin prolonged in a long, irregular manner at its middle towards the medial fascia. All three fasciæ are narrowly connected up along the costa and termen so that two large fenestra are enclosed, the outer regular, the inner very irregular. The iridescence of the wings is similar to that of *trifasciata*.

Type in the Pusa collection.

This species was collected by Mr. C. M. Inglis along a very heavily wooded hill-stream.

Rhinocypha quadrimaculata hemihyalina, sub-sp. nov. (Plate VIII, fig. 5.)

A single pair from Shillong, 16th October 1919, collected by T. Bainbrigge Fletcher.

Very similar to *Rhinocypha quadrimaculata quadrimaculata* (Plate VIII, fig. 1) but differs by the fascia on the forewing being much narrower.

Male. Head velvety black, marked with a minute, postocular yellow spot on either side of the occiput.

Prothorax and abdomen black, unmarked (or the markings may have faded).

Thorax black, with lateral, yellow markings and a mesothoracic triangle, pale lilaceous, extending as far as the alar sinus. Posterior femora white.

Wings similar to those of true *quadrimaculata* but the fascia on the forewings only covers the fore half instead of four-fifths.

Female. Head black, marked with yellow as follows :—small spots on either side of the ocelli, a streak on either side of the epistome, a spot at the same level adjacent to the eye and a spot on either side of the occiput.

Prothorax black with a fine middorsal yellow streak.

Thorax with the mesothoracic triangle long and narrow, lined out in yellow, a fine, parallel line of yellow, antehumeral in position, a fine posthumeral streak of the same colour incomplete below, and finally a broad, lateral, longitudinal yellow streak on the side of the thorax traversing the posterior part of the mesepimeron and the metepimeron.

Abdomen black with the middorsal carina finely yellow and a streak followed by a small spot, on the sides of the second to eighth segments.

Legs black.

Wings tinted with yellow at the base. Stigma black but yellow in the middle.

Abdomen, male 23 mm., female 21 mm. Hindwing, male 23 mm., female 28 mm.

Type (male) and co-type (female) in the Pusa collection.

SUB-ORDER ANISOPTERA.

FAMILY LIBELLULIDÆ.

Subfamily Cordulianæ.

Idionyx corona, Fraser, Bombay N. H. Journ., XXVII, pp. 690-691 (Sept. 1921). (Plate VII, fig. 5.)

A single female from the Bababuddin Hills, Mysore, 4,700 feet, 1st June 1915 : T. V. Ramakrishna Ayyar coll.

Abdomen 22 mm. Hindwing 38 mm. (The last five segments of the abdomen are missing ; the probable length of the whole would be about 40 mm.)

Head. Eyes large and globular, probably deep sea-blue during life, now reddish brown, moderately fused. Occiput small, black, with a tuft of stiff black hairs in the middle line and fringed behind with long yellow hairs, this fringe being continuous around the posterior margin of the eyes. Vesicle remarkably developed into a long, elevated spine shaped like the double crown of ancient Upper and Lower Egypt and 2·75 mm. in length, bluish black. Frons with a deep fissure, bronzed green or bluish green above and in front ; epistome black ; labium yellowish at the base, broadly blackish brown along the border as is also the labrum.

Thorax bronzed green marked by a narrow, bright yellow, lateral stripe which traverses the spiracle. The posterior border of the metepimeron bright yellow. Above blackish brown, unmarked.

Wings enfumed diffusely around the areolar network, the centres of the cells being clear. A diffuse saffronation along the costa as far as the stigma and most markedly at the base. Membrane white tinged with brown posteriorly. Stigma black unbraced, not quite 3 mm.

A single row of discoidal cells nearly as far as the node. Hypertrigone traversed once in the forewing, entire in the hind. Arc at the 2nd antenodal nervure. Loop 11 cells. Only 2 rows of cells posterior to Cu_1.

Nodal index :— $\frac{8\ 13}{9\cdot9}\left|\frac{12\cdot7}{9\cdot9}\right.$ Cu_1 angulated at its origin in the hindwing and rather lost in the general network in the right wing.

Abdomen black or bronzed black, unmarked save for a fine, middorsal, apical, yellow line on the 2nd segment.

Legs black, coxæ yellow, tibiæ yellowish or pale brown on the extensor surfaces. Moderately long and slim. Hind femora with a row of closely-set, long, evenly sized, fine spines. Tarsal claws bifid.

Type in the Pusa collection.

Idionyx corona race *nilgiriensis*, nov.

Two females, Burliyar, Nilgiris, 2,500 feet, 29th July 1921, collected by Major F. C. Fraser.

These females much resemble *I. corona* and cannot, I think, be regarded as specifically distinct. They differ as follows :—

The vesicle is shaped as a smooth horn of the same dimensions as in the type but is not indented in front (Possibly the vesicle in *I. corona* may have been indented artificially). [I do not think that this is so.—T. B. F.]

The dimensions vary :—abdomen 35 mm., hindwing 35 mm.

The eyes are a beautiful bottle green capped with reddish brown, the extent and position of the latter changing according to the angle at which the eyes are viewed.

The epistome has a small, yellow triangle at its lower part ; the labium is entirely bright yellow ; the labrum is not bordered with black.

The wings are perfectly hyaline but have saffron streaks in the subcostal and cubital spaces extending as far as the trigone. The nodal index varies widely. In one specimen it is :— $\frac{9\cdot17}{10\cdot11}\left|\frac{15\cdot8}{10\cdot10}\right.$ and in the other $\frac{8\cdot14}{10\cdot?}\left|\frac{13\cdot8}{9\ 10}\right.$.

The abdomen is black marked with yellow along the lower part of the sides of segments 1 to 4 and there are fine basal annules to segments 3 and 4. The fine, yellow line on the middorsal carina of segment 2 is absent. The end of the abdomen is not dilated.

Habitat. These two specimens were taken together in the bed of a rocky, mountain stream, both in the act of ovipositing in wet sand.

Type of *I. corona nilgiriensis* in Major Fraser's collection.

Idionyx ornata, Fraser, Bombay N. H. Journ., XXVII, p. 691 (Sept. 1921). (Plate VII, fig. 6.)

A single female from Shillong, 2nd June 1920, collected by T. Bainbrigge Fletcher.

" Taken in jungle and difficult to see on the wing."

Abdomen 38 mm. Hindwing 36 mm.

Head relatively large ; face brownish yellow, the upper part of frons a deeper colour and slightly metallic ; labium reddish brown, dark ; vesicle dark yellow, highly developed and projecting as a blunt spine but not to the same extent as in *I. corona*. Eyes probably deep blue during life but now reddish brown ; occiput small, black.

Thorax small, metallic green, marked with bright yellow as follows :— antehumeral, oval spots not extending above halfway to the alar sinus, well defined and pointed below ; alar sinus yellow ; a lateral, broad stripe and the posterior border of the metepimeron more or less broadly yellow. Above blackish but crossed by a yellow stripe which connects up laterally with the yellow stripes.

Legs slim, coxæ yellow, femora and tarsi black ; tibiæ bright yellow with black spines.

Abdomen long, laterally compressed, broadening towards the anal end, shiny black, the ventral borders of segments 2, 3 and 8 marked with bright yellow. The dorsum of the second segment broadly and that of the third and basal half of the fourth finely marked with pale yellow. Anal appendages short, pointed, black.

Wings hyaline, saffronated at the bases only as far as the second antenodal nervure. Membrane white ; stigma black, covers $2\frac{1}{2}$ cells.

Nodal index : — $\frac{9\cdot13}{10\cdot9}\left|\frac{13\cdot8}{9\cdot11}\right.$. One row of discoidal cells nearly as far as the node in the right wing, beyond the node in the left forewing ; hypertrigones traversed twice in the forewings, once in the hindwings ; 3 rows of cells posterior to Cu_1 in the forewing ; 13 to 16 cells in the loop.

Until the males of these two insects are found, their position will remain uncertain. At present the peculiar development of the vesicle separates them rather sharply from other species of the genus.

Type in the Pusa collection.

Macromia atuberculata, sp. nov.

A single male from Hasimara, Duars, Bengal (without date), collected by C. M. Inglis.

Male. Abdomen 44 mm. Hindwing 37 mm.

Labium brown ; labrum black, the lateral lobes bright yellow ; epistome black marked with yellow, a broad yellow stripe across the lower part of frons, two small spots at about the centre of the face, and a somewhat larger spot on each side against the eyes. Frons metallic green. Eyes probably emerald green during life ; occiput black.

Prothorax brown spotted with yellow.

Thorax metallic green marked with yellow as follows :—a bright citron yellow humeral stripe, the antealar sinus, a moderately broad, oblique stripe about the middle of the side and a small spot on the hinder part of the metepimeron. Beneath, thorax yellow marked with a triangular spot of black posteriorly and two oval spots of black.

Legs long and rather slender, black, the coxæ and bases of the femora yellow.

Wings hyaline, unmarked at the base ; stigma black, small ; two rows of discoidal cells ; one row between Rs and Rspl ; all trigones and subtrigones entire ; loop made up of 6 to 7 cells ; nodal index $\frac{8\cdot15}{9\cdot10}\left|\frac{15\cdot6}{11\cdot8}\right.$, membrane black, hypertrigones traversed four times in forewing, twice in the hind.

Abdomen black marked with yellow as follows :—a small, basal, lateral streak on the first segment ; segment 2 almost entirely yellow, but with an irregular, apical band of black ; segment 3 with a semilunar, lateral, basal streak and a subdorsal, triangular spot which is almost confluent with its fellow on the far side of the segment ; segments 4, 5 and 6 similar but without the basal spot ; segment 7 has a rather broad, yellow annule at the base which on the dorsum is prolonged back as a small, quadrilateral tongue along the dorsal carina ; segment 8 has a fine, basal, dorsal line and a streak along the side very low down ; segments 9 and 10 are entirely black ; segment 10 differs from that of all other species of *Macromia* by having its dorsum quite smooth and without the usual tubercle or tubercles.

Superior anal appendages black, armed with a robust spine at the outer side of the apical third. Inferior black, subtriangular, curling up at its apex.

The smooth character of the tenth segment will serve to distinguish this species from all others.

Type in the Pusa collection.

FAMILY ÆSHNIDÆ.

Subfamily Gomphinæ.

Platygomphus martini, sp. nov.

Male and female from Shillong, 6th and 17th June 1920, collected by T. Bainbrigge Fletcher.

Abdomen 37 mm. in both sexes, hindwing 30 mm. in male, 32 mm. in female.

Both sexes exactly similar in colouring.

Male. Head black with the exception of the foreborder of the frons and the lateral lobes of the labrum which are bright yellow. Occiput with no special armature.

Prothorax black spotted with yellow.

Thorax black in front and on the dorsum, yellow on the sides. A narrow mesothoracic collar which is just divided in the middle and joined to the antehumeral bands so as to form inverted " 7 "s. Laterally, there are two narrow, black stripes on the first and second lateral sutures, the latter curving back along the posterior and lower margin of the metepimeron. The tergum is spotted with yellow.

Legs very long and robust, entirely black.

Wings hyaline, the extreme base with a slight saffronation only ; stigma black, about one-fourth the length of the distance between the node and the distal end of stigma, feebly braced ; four rows of post anal cells in the hindwing, two for a very short distance in the forewing ; only one nervure between $M_{1\ 3}$ and M_4 in the hindwing, three in the forewing ; two rows of discoidal cells nearly as far as the node ; two rows of cells between M_1 and M_2 beginning nearer the stigma than the node ; nodal index $\frac{12\cdot17}{12\cdot12}\frac{8\cdot11}{12\cdot13}$. Two rows of cells between M_1 and M_{1a} at outer end of stigma. No basal postcostal nervure.

Abdomen dilated at the base and also at the sides of segments 7 to 9, black, marked with yellow as follows :—first segment all yellow except for two subdorsal, transversely oval, black spots, second segment with the middorsum broadly yellow, the edges of this marking constricted in two places, the sides striped with yellow and the auricles of the same colour, third to sixth segments with the dorsum very finely yellow, but this broadening a little towards the base of the segments where the yellow expands into narrow yellow annules, the third segment has also a short yellow stripe at the sides adjacent to the base, seventh segment with a broadish annule at the base which tapers away apically along the dorsal carina, eighth segment with the dorsum finely yellow, ninth and tenth all black.

Anal appendages both divaricate, the superior yellow, the inferior black, both thick at the base and tapering to a point, about as long as segment 10.

This insect differs from *Platygomphus fecæ* and *P. dolobratus* by the face which is largely black, marked with yellow (instead of largely yellow with sparse black markings), by the absence of yellow spots on the dorsum of the thorax between the antehumeral lines, by the complete lateral stripes on the sides of thorax, and finally by the great abbreviation of the markings on segments 3 to 6. The sides of the terminal segments are also entirely black.

Type (male) and co-type (female) in the Pusa collection.

Stylogomphus, gen. nov.

Segments of abdomen gradually diminishing in length from 7 to 10 ; appendages a little longer than segment 10, the superior curved, at first divaricate and then approximating and with the ends overlapping, the inferior cleft for about half its length, the two branches parallel.

Wings. All trigones and hypertrigones entire, the trigone of the hindwing rather elongate ; no basal antenodal of the 2nd series ; the stigma comparatively small, less than one-fourth the distance between node and distal end of stigma in the forewing ; sectors of arc not approximating ; M_4 and Cu_1

nearly parallel throughout their length, only 7 cells between at the termen ; no trigonal supplement ; only one nervure between $M_{1\ 3}$ and M_4 in the hindwing, two in the forewing ; only one cubital nervure to all wings ; one row of cells between M_1 and M_1a ; stigmas braced ; one row of cells between M_1 and M_2 to within 2 cells of the stigma ; three rows of postanal cells in the hindwing, only one row in the forewing ; forking of $M_{1\text{-}2}$ and M_3 symmetrical in both wings ; the distal angle of the trigone in the hindwing not separated from M_4 by a stalk.

Legs robust and moderately long, all the femora spined minutely.

Genotype : *Stylogomphus inglisi*, Fraser.

Stylogomphus inglisi, sp. nov. (Plate VII, figs. 3, 3a and 3b.)

One male from the Tista River, Darjiling District, 1,500 feet, 8th June 1920, collected by C. M. Inglis.

Length of abdomen with appendages 25·5 mm. Hindwing 21 mm.

Head black marked with bright yellow as follows :—a transverse streak on the upper part of frons, a median streak on the lower part of epistome, a ateral spot on the labrum and the labial palps. No prominences on the occiput.

Prothorax black marked with yellow on the posterior lobe.

Thorax black on the dorsum, yellow on the sides. A complete, mesothoracic collar present. The front bearing longish, oval, yellow spots which converge on each other above but do not meet the mesothoracic collar nor the alar sinus. The sides marked with a pair of irregular black, narrow stripes which are connected by a narrow isthmus about half-way up the sides. Tergum spotted with yellow.

Legs black, the coxæ and trochanters yellow.

Wings saffronated at the extreme base ; stigma black ; costa black.

Nodal index $\frac{9\cdot12}{9\ 9}\Big|\frac{11\ 9}{7\ 9}$.

Abdomen black marked with yellow as follows:—the sides of the first segment broadly and a stripe on the dorsum which is continuous with a similar stripe on the second (on the latter, however, it shows a median dilatation), the sides of the second broadly, and the upper surfaces of the oreillets.

A middorsal, oval, basal spot on segment 3, as also its base laterally, and finally, narrow lunules at the bases of 4, 5 and 6 slightly interrupted on the dorsum. The rest black.

Anal appendages unlike any other species of *Gomphine* that I know of. The superior very long and attenuated, pale yellow, broad at the base where they are a little convergent and then curving first out and again in to fine

points which overlap one another ; seen in profile they curve strongly downward and at the tips sweep up again in a fine curve ; laterally there are two, equal, robust, blunt tubercles not amounting to spines. The inferior black, triangular, not as long as the superior, the apex split to about the middle of the appendage ; seen in profile the appendage is slightly curved with its convexity above and nearly parallel to the superiors.

This species approaches closest to *Onychogomphus modestus*, Selys, but is distinguished by its appendages and also by the following features : the superior appendages are all yellow instead of browny black at the apical half, segment 7 is all black and has no broad, yellow, basal spot, the nodal nervures are fewer, the size is smaller and, lastly, the mesothoracic collar is whole (broken in *modestus*).

The genus differs from *Onychogomphus* as follows :—

i. There are only 3 rows of postanal cells in the hindwing.

ii. The anal area in the forewing proximal to the trigone has only one row of cells.

iii. The first postanal cell is undivided.

Type in the Pusa collection.

Leptogomphus spirillus, sp. nov. (Plate VII, figs. 2 and 2a.)

One male, collected at mile 23, on the Gauhati-Shillong Road, at an elevation of about 1,000 feet, on 2nd August 1919, by T. Bainbrigge Fletcher. One male (type) from Tura, Garo Hills, Assam, collected by S. Kemp, June-July 1917.

Male. Abdomen 32 mm. Hindwing 28 mm.

Head black, the frons bright yellow along the foreborder. Occiput black without armature.

Prothorax black with a fine, yellow collar in front, a lateral spot of the same colour on either side and a geminate spot on the posterior lobe.

Thorax black in front on the dorsum, bright greenish yellow at the sides. A complete mesothoracic collar which is not connected to two humeral, oval, yellow spots ; these latter do not reach as far as the alar sinus and converge on each other above. The tergum spotted with yellow. Two narrow, black lines on the 1st and 2nd lateral sutures.

Legs black, the coxæ yellow.

Abdomen black marked with yellow as follows :—the first segment narrowly at the base on the dorsum and broadly on the sides ; second segment with a dorsal spot shaped like the head of an arrow with its apex directed

back, a lateral spot and the upper surface of the oreillets ; third segment with the dorsal carina narrowly, this marking tapering away towards the apex ; fourth to seventh segments with the dorsal carina finely yellow, or this marking may be entirely absent. Rest of abdomen all black.

Anal appendages highly specialized, the superior bright yellow, the inferior black. Superior appendages longer than segment 10, curling cork screw fashion, first outward, then in and finally outward again, the end finely pointed, gradually tapering to the end ; on its outer side, near the base, a strong spine. Inferior appendages nearly as long as the superior, markedly divaricate.

Wings hyaline, stigma black, about one-fourth the length of the distance between the node and the distal end of stigma, braced ; 2 to 3 nervures between M_{1-3} and M_4 in the forewing, only one in the hindwing ; no basal postcostal nervure ; arc opposite the second antenodal nervure ; five rows of postanal cells in the hindwing, two in the forewing ; two rows of discoidal cells as far as the node ; all trigones, subtrigones and hypertrigones free ; two rows of cells between M_1 and M_2, beginning nearer the stigma than the node ; 16 antenodal nervures in the forewing, 13 postnodals, 10 and 11 respectively in the hindwing. Anal excavation of hindwing very shallow.

Type (male), from the Garo Hills, in the Indian Museum collection. Co-type, from the Khasi Hills, in the Pusa collection.

Gomphus bicornutus, sp. nov.

A single female from Shillong, 18th June 1920, collected by T. Bainbrigge Fletcher, "hovering over a stream."

Abdomen 47 mm. Hindwing 40 mm.

Female. Head black above, the frons along its foreborder bright yellow. Face black, marked with yellow as follows : —the epistome narrowly where it borders on the labrum, the lateral lobes of the labrum and two transversely oval spots on the labrum itself. Labium black. The occiput furnished with two long, medial spines which project backward and resemble those of *Onychogomphus cerastes* but are much longer and more robust. (The insects differ from each other in all other respects and are not readily confused.)

Prothorax black marked with yellow.

Thorax largely black, marked with bright yellow as follows :—an antehumeral stripe joined to a mesothoracic collar so as to form inverted " 7 "s. The collar finely divided in the middorsum. A small, round, humeral spot near the alar sinus, a broad, posthumeral stripe and the greater part of the metepimeron. In addition to these markings there are two small spots on the

lateral black, one above near the root of the wings and the other below near the hind coxa. Tergum spotted with yellow.

Legs stout, short, finely spined, black, the trochanters yellow.

Abdomen black, marked with bright yellow as follows :— the first segment with a large, lateral spot at the apical half and a smaller, triangular, dorsal spot at the apical border, second segment almost wholly yellow and only marked finely with black at the apex, the black projecting basalwards on the middorsum, third segment with nearly the basal half yellow on the dorsum and less so on the sides, segments 4, 5 and 6 with only small, basal, semilunar spots just meeting over the middorsum, segment 7 with rather more than the basal half yellow, remaining segments black.

Anal appendages small, conical, black.

Wings saffronated at the base as far out as the trigones and rather further in the subcostal space. Stigma braced, black, rather more than one-fourth the length of the distance from the node to the distal end of the stigma. Nodal index $\frac{14.18|18.15}{15.14|14.16}$ Two rows of cells in the discoidal field as far as the node ; two rows between M_1 and M_2 beginning nearer the node than the stigma ; six rows of postanal cells in the hindwing, two in the forewing ; no basal antenodal nervure of the second series ; only one transverse nervure between $M_{1,3}$ and M_4 in the hindwing, two in the forewing : are opposite the second antenodal nervure ; all trigones, hypertrigones and subtrigones entire.

This fine insect can be distinguished from all other Gomphines by the armature of the occiput.

Type in the Pusa collection.

Gomphus risi, sp. nov.

A single female from near Mangpu, Darjiling District, 3,400 feet, 31st August 1920, collected by C. M. Inglis.

Length of abdomen 49 mm. Length of hindwing 42 mm.

Female. Face largely black, labium yellow, labrum black with two basal spots of yellow at the outer angles, the labial palps of the same colour. Epistome with a fine margin of yellow at the lower part and a small spot of the same colour on each side touching the eyes ; frons with a band of yellow on its foreborder ; occiput black, furnished with two small points at the middle of its posterior border.

Prothorax black with two small spots of yellow on its middle lobe.

Thorax black marked with yellow as follows :—a mesothoracic collar not broken in the middle line, a fine line on the midthoracic carina, narrow

antehumeral stripes which do not meet the mesothoracic collar, a small, posthumeral spot at the upper part of thorax, a broad, lateral stripe and the whole of the metepimeron. Between these two latter markings are the rudiments of a third lateral stripe represented by a spot below and two spots above.

Legs black, short, yellow on the flexor surfaces of the femora.

Wings hyaline; stigma black, braced, more than one-fourth as long as the distance between the node and the distal end of stigma; no basal antenodal of the second series; all trigones, subtrigones and hypertrigones entire; two rows of discoidal cells as far as the level of the node; four rows of postanal cells in the hindwing, 2 in the fore; nodal index $\frac{14.20}{12.12}\left|\frac{18.12}{13.11}\right.$; two transverse nervures between $M_{1\text{-}2}$ and M_3 in the forewing, 1 in the hind; arc opposite the second antenodal nervure; 2 rows between M_1 and M_{1a} beginning nearest the stigma.

Abdomen black marked with yellow as follows:—first segment with a dorsal spot extending its whole length and a large, lateral spot; second segment similarly marked, the dorsal spot tapering apically; third to sixth segments with triangular, basal spots, about one-fourth the length of the segments, which nearly meet over the dorsal carina; seventh segment with the whole of its basal half yellow, the black encroaching on it dorsally; eighth to tenth segments entirely black.

Anal appendages small, pointed, conical, black.

This fine insect, one of our largest Gomphines, closely resembles *Gomphus xanthenctus*, Williamson, but differs from it by having the mesothoracic collar undivided in the middle line, by the antehumeral stripe not joining the mesothoracic collar and by the incomplete stripe between the two lateral thoracic stripes, etc.

Type in the Pusa collection.

Onychogomphus echinoccipitalis, sp. nov.

A single female taken whilst ovipositing over a stream, at mile 23 on the Gauhati-Shillong Road, at an elevation of about 1,000 feet, on 2nd August, 1919, by T. Bainbrigge Fletcher.

Abdomen 34 mm., hindwing 35 mm.

Female. Head black marked with yellow. The face olive green, the lower part of epistome paler; labrum and lateral lobes yellow, the base of former narrowly black. A bright yellow stripe across the front of frons, interrupted in the middle by the suture which is black. Occiput fringed posteriorly with a row of fine spines to the number of about twelve.

Thorax black marked with yellow as follows :—an interrupted mesothoracic collar ; antehumeral stripes which are well separated from the collar ; some spots on the tergum and, lastly, two lateral stripes which have the borders a little diffuse.

Legs stout, short, black, the femora striped with yellow.

Wings hyaline ; stigma black, equal to about one-third the distance between the node and the distal end of stigma ; trigones, subtrigones and hypertrigones free, but the hypertrigone in the left forewing is traversed twice and there are the beginnings of nervures in the subtrigone and trigone of the same wing (these are evidently aberrations): two rows of discoidal cells nearly as far the node in the forewing ; two rows of cells between M_1 and M_2, beginning nearer the stigma than the node ; five to six rows of cells in the postanal area of hindwing, two rows in the forewing ; nodal index $\frac{9.21}{10.11}\left|\frac{18\cdot10}{12\cdot10}\right.$; only one nervure between $M_{1\text{-}3}$ and M_4 in the hindwing, two in the forewing.

Abdomen very stout and of even width throughout, black, marked with yellow as follows :—first segment yellow laterally and with an apical annule which broadens at the middorsum ; second segment yellow laterally, the yellow being traversed obliquely by a narrow black line, a bilobed, lanceolate, dorsal spot ; third segment with a large, basal, subtriangular spot covering about the basal half of the dorsum ; fourth to seventh segments with similar but rather smaller spots whilst that on the seventh is more quadrate than subtriangular ; eighth and ninth segments with small, semilunar, subdorsal, basal spots on either side, the joints between these segments being finely yellow ; tenth segment entirely black.

Anal appendages very small, conical, pointed, black.

So long as the male of this species is unknown, it cannot be certain that it belongs to the genus *Onychogomphus*. Mr. Bainbrigge Fletcher took the specimen practically in company with another Gomphine, *Leptogomphus spirillus*, a male, which however differs entirely in its generic characters and cannot be the male of this species. So far as the character of the wing venation goes, the specimen must belong to the genus *Onychogomphus*.

Type in the Pusa collection.

Subfamily Æshninæ.

Gynacantha bainbriggei, sp. nov.

Three males from Gauhati, 16th to 19th November 1919, collected by T. Bainbrigge Fletcher.

Male. Abdomen 50 mm. Hindwing 47 mm.

Head. Eyes opalescent bluish grey, frons pale brown with a not very well defined, black, T-shaped mark above ; face pale brownish yellow without markings : occiput very minute, yellow ; basal joint of antennæ ochreous ; ophthalmic suture with a fringe of longish hairs.

Prothorax brown at the sides, diffusely black on the dorsum.

Thorax pale brown, with darker middorsal and humeral fasciæ through which runs a fine dark line. No lateral markings.

Abdomen pale brown marked with shades of grey and black and a pair of sky-blue spots at the distal end of each segment, except the first, eighth, ninth and tenth ; on the third segment, a pair of spots of the same colour at the proximal end ; the distal spots are edged apically and outwardly with black, this colour being continued forward subdorsally and tapering away until finally lost ; on the last three segments the black entirely obscures the spots. The oreillets are large and coloured sky-blue above, the posterior border minutely toothed.

Anal appendages very long and narrow, 7 mm., fringed inwardly with very long hairs.

Legs black, brown at the base of the femora.

Wings hyaline, the stigma pale brown, 3·5 mm. Forewing with 26 antenodal nervures and 21 postnodal ; hindwing with 21 antenodal and postnodal nervures; hypertrigones traversed 6-8 times, trigones variably traversed by 3-5 nervures which may or may not form a net-work; loop with 11-13 cells.

Habitat. Gauhati, Assam. The specimens were beaten up from dense jungle during the daytime and are evidently crepuscular in habits.

Note. The above description was drawn up by Major Fraser from a spirit specimen. The eyes in life are bright green. This species is found by day in bamboo jungle at Gauhati.

Type (a spirit specimen) in the Pusa collection.

Another male specimen, taken at Gauhati on 13th April 1920, and named as *G. bainbriggei* by Major Fraser, was noted as having the following coloration when fresh :— eyes green ; thorax green with blackish markings, a blue spot at base of each wing, a blue spot between the hindwings and a large blue spot dorsally posteriorly ; second abdominal segment green with narrow blue transverse stripe and blue oreillets, other segments brown with green spots posteriorly obsolete on the last three segments.

This species was also found commonly at Margherita, N.-E. Assam, in May 1920.— [T. B. F.]

Gynacantha hanumana, sp. nov.

A single male from Mangpu, Darjiling District, 5,200 feet, 18th February 1920, collected by C. M. Inglis.

Abdomen 43 mm. Hindwing 44 mm. Anal appendages 4·5 mm.

Male. Head ashy, a thick, black, T-shaped mark on the upper surface of frons.

Prothorax pale brown, darker on the dorsum.

Thorax pale ashy grey, the middorsal carina diffusely black. The sides clouded with dark sooty grey.

Wings a little enfumed but the bases unmarked. Stigma whitish yellow, the postcostal margin black-bordered. Loop 12-13 cells ; 8-10 cubital nervures in the forewing, 7 in the hind ; 5-6 supplementary nervures to the bridge in the forewing, 4-5 in the hind ; sectors of arc arising from the middle of arc, the latter being situated between the third and fourth antenodal nervures ; trigone of forewing traversed 4 times, the innermost nervures being joined to the basal side by a short nervure, 3-4 times in the hindwing ; M^4 with a dilatation at the angle which it makes as it turns down abruptly to meet the termen ; 4-6 rows of cells between Rs and Rspl and Mspl and M_4 ; hypertrigones traversed 5 or 6 times ; nodal index $\frac{19\cdot26|24\cdot18}{20.19|19.21}$. The stigma of forewing, 3·7 mm., is a little larger than that of the hindwing, finely braced, the brace being a little sinuous.

Legs ochreous, the hind femora with a row of very short spines, longer at the distal end ; tibial spines long and numerous ; claw-hooks robust.

Abdomen long and parallel-sided, transverse ridges on the second to the eighth segment, segment 3 well constricted, oreillets moderately large. Bluish grey in colour, the dorsum of segments broadly brownish black, especially apically. The third segment, basal to the transverse ridge, entirely pale blue, the oreillets bright blue narrowly margined with black. Each segment from 3 to 8 has a pair of subdorsal, blue spots at the apical end.

Anal appendages very long and slender, the inferior being 2-5ths the length of the superior, blackish brown, the superior fringed inwardly with long, black, stiff hairs. The superior have the inner margin very sinuous and the apex pointed.

This insect is the size of *G. bayadera* but is distinguished from it by the complete, black T-shaped mark on the upper surface of frons and by the greater number of ante- and post-nodal nervures.

Type in the Pusa collection.

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MEMOIRS OF THE DEPARTMENT OF AGRICULTURE IN INDIA

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BY

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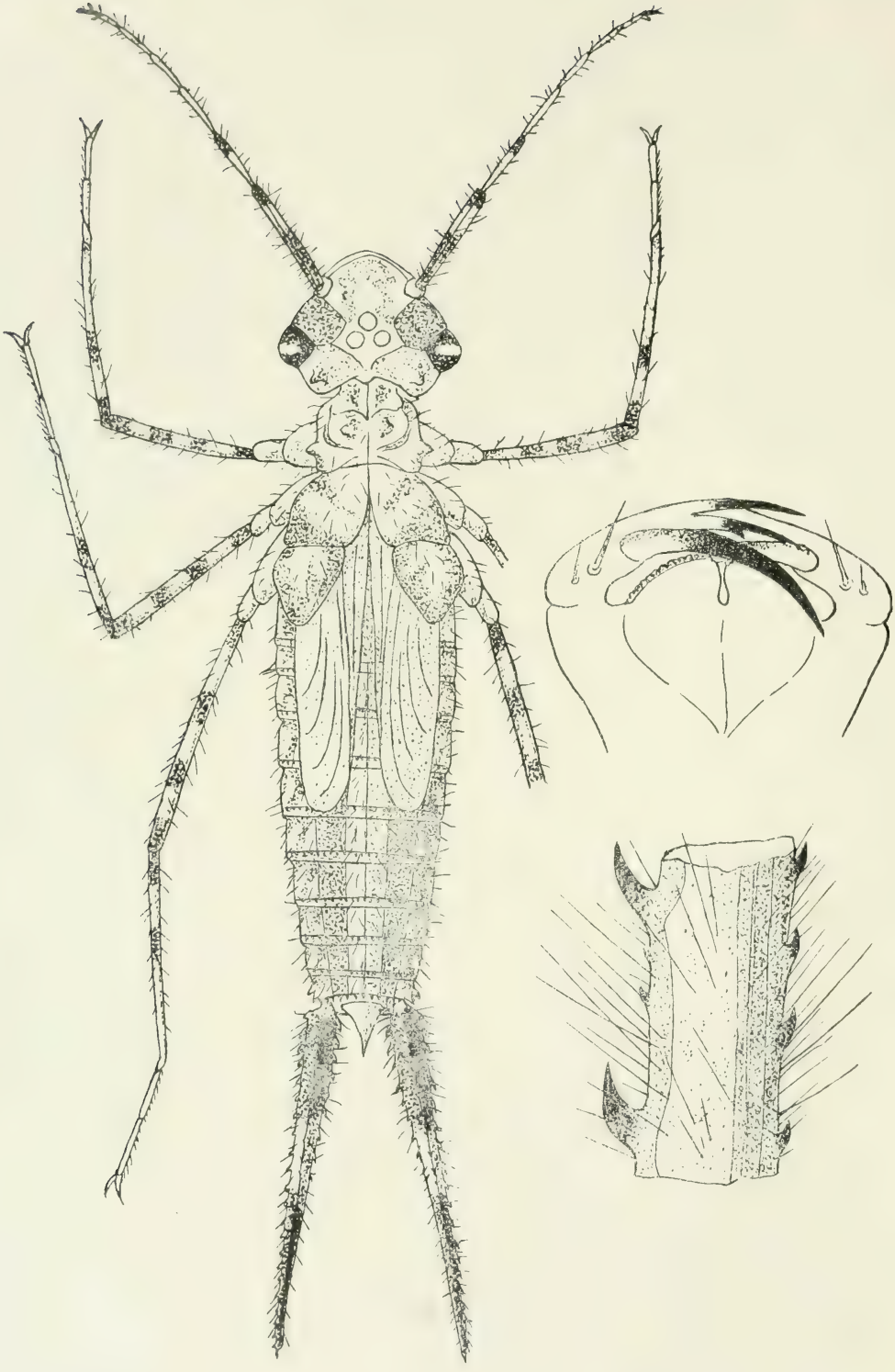

ADULT LARVA OF *RHINOCYPHA IGNIPENNIS*.

FURTHER NOTES ON *RHINOCYPHA* LARVÆ.

BY

MAJOR F. C. FRASER, I.M.S.

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THE ADULT LARVA OF *Rhinocypha ignipennis* (Plate IX).

IN the Memoirs of Pusa, Entomological Series, Vol. VII, No. 2, June 1920, I described the young larva of a *Rhinocypha* which Mr. Bainbrigge Fletcher showed was that of *R. ignipennis*. Several adult larvæ have since been taken by the same collector so that I am now able to add to the previous description and to correct the wrong impression I had formed that these larvæ do not possess caudal gills.

Caudal gills are certainly absent in the first two instars as in the majority of Zygopterous larvæ, breathing being purely rectal or taking place through the thin cuticle, the gills being either undeveloped, hairy or filamentous. In the young larvæ of *ignipennis* they are certainly absent or the autotomy must be extraordinarily neat.

If a comparison be made between the young and adult instars, great changes will be noted, the legs for instance, which are enormously out of proportion to begin with, fail to keep pace with the growth of the trunk and eventually compare well with the length of the body.

There are some smaller but important changes in the mask which flattens and lengthens, the middle lobe becoming fairly deeply cleft.

The caudal gills develop, closely paralleling those of *Micromerus*, and the usual changes associated with the development of the wing sheaths take place in the thorax.

The whole appearance of the larva is strikingly like that of *Micromerus* and differs only in detail. The plate given here of *R. ignipennis* should be compared with that given for *Micromerus lineatus* in the *Records of the Indian Museum*, Vol. XVI, Part 11, No. 9, 1918.

The antennæ are sparsely hirsute, the pedicel is strongly ribbed longitudinally, pigmented at its apex and the basal half, the second joint is also pigmented apically.

The eyes are small, projecting laterally and are deeply pigmented with blackish brown, this colour also covering a contiguous area of the epicranium which gives a false idea of the size of the eyes.

The frons is mottled with a serpiginous pattern of brown. On the occiput are found two prominent, dorsal spines, situated on the postocular lobe and nearer the middle line than in *Micromerus*, and its posterior border is deeply concave. On the synthorax there are two dorsal spines situated near the middle of the pronotum and also two lateral ones. The mesopleura are more square and the metapleura rounder than in *Micromerus*. The legs are very similar to those of the same insect, but the distal pigmented band on the femur is darker and there are apical and subapical bands on the tibiæ as well. The caudal gills are armed with more robust spines and the basal third and apical half are deeply pigmented in some specimens or only in the basal half of others. The armature varies, the spines being closely or widely set and the number varying. The *appendix dorsalis* is represented by a median, conical eminence lying between the two caudal gills.

The adult mask is almost identical with that of *Micromerus*, the fissure being either open or its edges overlapping apically so as to enclose a small foramen. It is remarkably flattened, and elongated, reaching in juveniles to the base of the hind legs and in adults to the middle pair.

The gizzard, which was examined with some difficulty owing to the larvæ having hardened in alcohol, has sixteen folds, each bearing a row of four to five teeth.

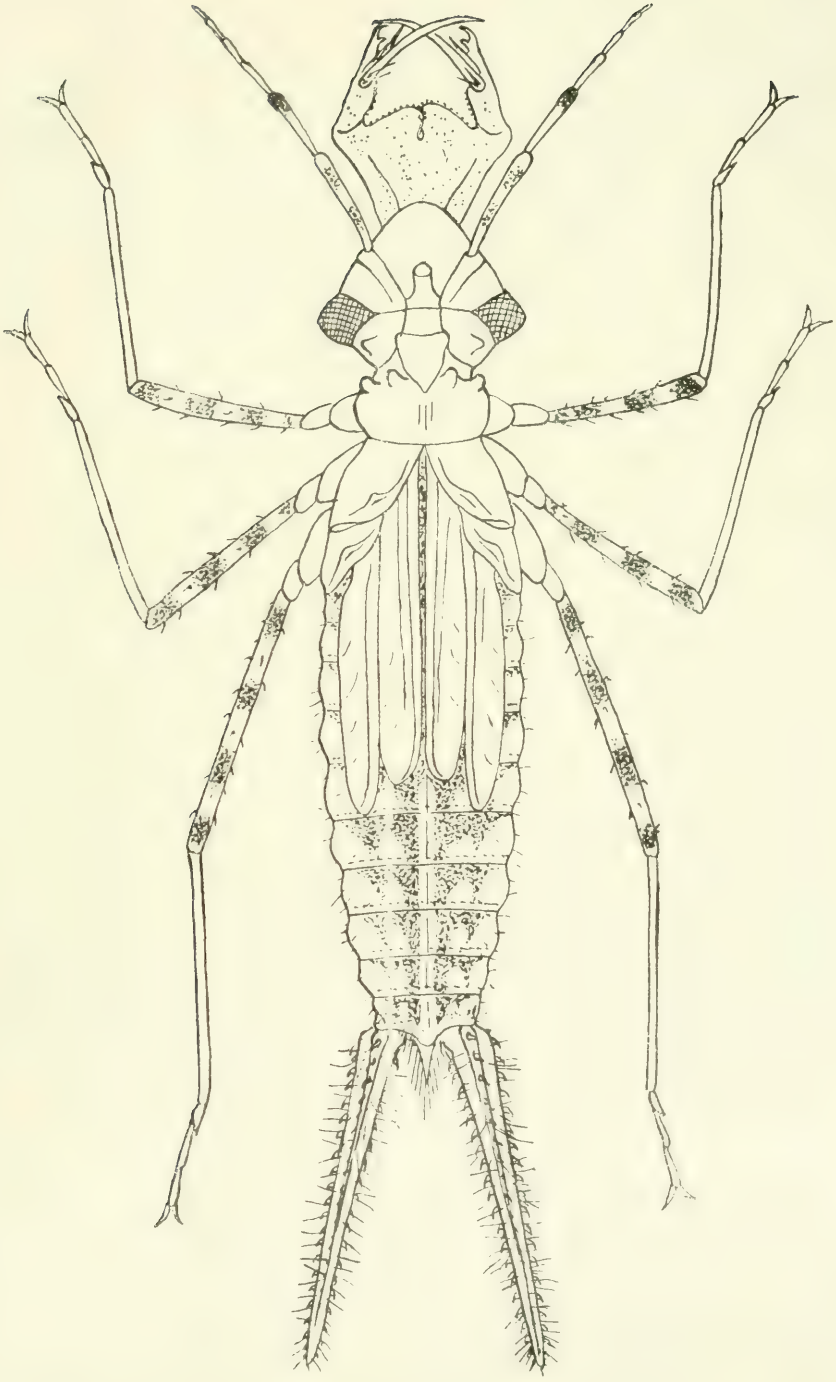
The total length of the adult larva is 24·5 mm., abdomen 11 mm., caudal gills 7·5 mm.

The larvæ were collected in running streams on débris in turbid water at Shillong on 11th May 1920.

Description of the larva of *Rhinocypha bisignata*, Selys (Plate X).

One larva from Kallar, Nilgiri District, *ca* 1,500 ft., collected by T. Bainbrigge Fletcher, 27th February 1920. One exuvium from Khandala, *ca* 2,000 ft., 8th May 1920.

The former specimen was taken amongst weed, the latter was found clinging to a clay bank about six inches above the water line of a small stream over which a large number of the adult insect was flying or perched on twigs overhanging the stream.



ADULT LARVA OF *RHINOCYPHA BISIGNATA*, SELYS.

The females of this insect and of *Micromerus lineatus* are difficult to distinguish from one another when at rest and if no males be present, the only guide to go upon, unless the insects be captured and examined, is the relatively larger size of the former. The two insects are rarely found together although they may occur in the same district and prefer similar haunts, such as a rapidly flowing stream, overhung and densely shaded by trees and shrubs. Both breed in rapidly flowing, and clear streams.

Bearing these facts in mind, it is not surprising to find that the two larvæ bear the closest resemblance. To bring this out, I have sketched the larva of *R. bisignata* of the same size as that of *M. lineatus*, shown in the *Records of Indian Museum*, Pl. XXIII, p. 198, Vol. XVI (1918), although the former is actually and relatively larger.

In *R. bisignata* the pigmentation on the legs and abdomen is of a more uniform density and that of the abdomen is of a less intricate character than in *M. lineatus*. The second joint of the antennæ has two pale brown rings and the third is tipped distally with blackish brown, the remaining segments being unpigmented. The caudal gills are shorter and armed with more robust spines.

The mask is similar in shape but the fenestration and overlapping of its edges is not so well marked. The lateral lobes are armed with three hooks and, viewed laterally, resemble a three-fingered hand ; the upper hook is long, slender and jointed at its base, the middle one about half the length of the former, whilst the inferior hook is laminate and bifid at its extremity, thus resembling the cheliped of a crab. The lobes overlap widely across the middle line.

The close resemblance between the two larvæ suggests a closer alliance between *Micromerus* and the Group *bisignata* of *Rhinocypha* than exists between the latter and the remaining groups.